aps ASSOCIATION FOR PSYCHOLOGICAL SCIENCE

Perspectives on Psychological Science
7(4) 384–403
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DOI: 10.1177/1745691612449021
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Vocational Interests and Performance: A Quantitative Summary of Over 60 Years of Research

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Abstract

Despite early claims that vocational interests could be used to distinguish successful workers and superior students from their peers, interest measures are generally ignored in the employee selection literature. Nevertheless, theoretical descriptions of vocational interests from vocational and educational psychology have proposed that interest constructs should be related to performance and persistence in work and academic settings. Moreover, on the basis of Holland's (1959, 1997) theoretical predictions, congruence indices, which quantify the degree of similarity or person–environment fit between individuals and their occupations, should be more strongly related to performance than interest scores alone. Using a comprehensive review of the interest literature that spans more than 60 years of research, a meta-analysis was conducted to examine the veracity of these claims. A literature search identified 60 studies and approximately 568 correlations that addressed the relationship between interests and performance. Results showed that interests are indeed related to performance and persistence in work and academic contexts. In addition, the correlations between congruence indices and performance were stronger than for interest scores alone. Thus, consistent with interest theory, the fit between individuals and their environment was more predictive of performance than interest alone.

Keywords

vocational interests, performance, grades, person–environment fit

Beginning in the early 1900s (Parsons, 1909), pioneers in the area of vocational interests suggested that "the developments with regard to the diagnostic meaning of interests would prove to be one of the great, if not the greatest, contributions to applied psychology" (Strong, 1943, p. vii). Despite this and other early claims that vocational interests could be used to distinguish successful workers and superior students from their peers, interest measures are generally ignored in the employee selection literature. As evidence of this neglect, Van Iddekinge, Putka, and Campbell (2011) noted that interests have been excluded from several recent reviews of the employee selection literature in which psychologists have generally focused on personality and cognitive ability as predictors of performance.

It is likely that the reason these measures have not been used in the work context is the seemingly small relationship between interests and performance. We define performance broadly as behavior that is goal relevant and that can be evaluated in terms of its degree of contribution to relevant goals (J. P. Campbell, Gasser, & Oswald, 1996). With this definition, completing assigned tasks at work, assisting coworkers, and staying with the organization are behaviors that are directed toward accomplishing organizational goals, whereas doing well in classes and completing a degree are behaviors focused on academic goal attainment. Research on the relationship between interests and performance has been mixed, and an early meta-analysis suggested that the correlation between interests and job performance is only .10 (Hunter & Hunter, 1984). Subsequent studies have used this evidence to conclude that interests are not effective predictors of performance criteria (e.g., Barrick & Mount, 2005; Schmidt & Hunter, 1998).

Although this early meta-analytic work (e.g., Hunter & Hunter, 1984) has been influential, it has several limitations that necessitate further examination. First, it represents only a small fraction of the currently available research, and recent empirical work on interests and performance suggests that the relationship may be stronger than originally thought (Van Iddekinge et al., 2011). Second, the meta-analysis was based on a single inventory (i.e., the Strong Interest Inventory) and, therefore, may not generalize to other interest measures. Third, only a single correlation was reported between interests and

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performance. Given Holland's (1959, 1997) seminal and widely researched work identifying six interest types, the relationship between interests and performance may be more complex and may not be represented well by a single correlation. We believe that understanding the true relationship requires consideration of both an individual's interests and whether the interests are congruent with his or her work environment and work activities.

Because of these limitations, additional research is needed to explicate the relationship between interests and performance. As such, the present study uses meta-analysis to examine the relationship between vocational interests and performance in both work and academic settings. Theoretically, interests serve as a driving force for job performance and tenure as well as school achievement and persistence in a particular educational program (Holland, 1997; Strong, 1943). However, the interest–performance relationship may or may not be the same at school and at work. Therefore, the present study separately examines whether vocational interest measures are positively correlated with job performance, school performance, and persistence in a job or academic program. We also attempted to identify the study characteristics that moderate these relationships.

Holland's (1997) Theory of Vocational Interests

Vocational interests reflect a person's preferences for behaviors, situations, contexts in which activities occur, and/or the outcomes associated with the preferred activities (Rounds, 1995; Su, Rounds, & Armstrong, 2009). The most widely researched theory on vocational interests was proposed by John L. Holland (1959, 1997), who organized vocational interests into six types, forming the hexagonal structure illustrated in Figure 1 and referred to collectively as the RIASEC model: Realistic individuals are interested in working with things, gadgets, or in the outdoors; investigative individuals are interested in science, including mathematics, physical and social sciences, and the biological and medical sciences; artistic individuals prefer creative expression, including writing and the visual and performing arts; social individuals enjoy helping people; enterprising individuals like working in leadership or persuasive roles directed toward achieving economic objectives; and conventional individuals are interested in working in well-structured environments, especially business settings. As illustrated in Figure 1, Holland's theory arranges the six interest types in a hexagonal ordering with distances between types inversely proportional to the degree of similarity between them—that is, adjacent types (e.g., realistic and investigative) are most related, alternate types (e.g., realistic and artistic) have an intermediate relationship, and opposite types (e.g., realistic and social) are least related.[1] Research has supported the hexagonal ordering of the six RIASEC interest types with large representative U.S. samples of college students and employed adults (Day & Rounds, 1998; Day, Rounds, & Swaney, 1998). In addition, a structural meta-analysis of RIASEC correlation matrices also supported the hexagonal ordering of types (T. J. Tracey & Rounds, 1993). In short, the hexagon appears to be a parsimonious and empirically supported interpretation of the RIASEC interest structure.

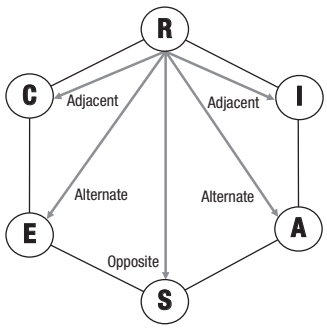

Fig. 1. Holland's hexagon model and degrees of congruence. R = realistic interests; I = investigative interests; A = artistic interests; S = social interests; E = enterprising interests; C = conventional interests.

Holland (1997) also proposed six types of work environments corresponding to the RIASEC interests and suggested that individuals are drawn to work environments that are compatible with their interests. More importantly, Holland argued that individuals' work attitudes and behaviors are influenced by the similarities between their interests and the environment: They tend to be more satisfied, more successful, and more likely to persist in an environment that fits their interests. For example, employees who are interested in social activities are more likely to perform well and stay in occupations that provide them with opportunities to help others.

Holland (1997) also recognized that an individual's environment is rarely homogeneous. In other words, there are many types of subenvironments, even within the same organization, that can influence an individual. For example, students in different majors at the same university or employees in different occupations within the same organization may have very different experiences. For this reason, Holland suggested assessing the subenvironment that has the largest influence on the individual when examining compatibility. Because occupations and college majors provide a salient and proximal environment to the person, they may also have the largest impact on individual behavior. Therefore, occupations and majors are commonly used to assess the work and academic environments, respectively. With this conceptualization, Holland's (1997) theory suggests that similarities between an individual's interests and his or her occupation or major will lead to positive outcomes, including better performance and longer tenure.

Person–Environment (P-E) Fit Theory

Because Holland's (1997) theory focuses on the similarities between individual and environmental characteristics, it is considered one aspect of the broader person–environment (P-E) fit framework. P-E fit is defined as the degree of compatibility or

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match between an individual and the characteristics of his or her environment (Kristof-Brown & Guay, 2010). The concept of fit has been around for nearly 100 years (e.g., Murray, 1938; Parsons, 1909) and has been influential in the areas of personality (e.g., Roberts & Robins, 2004), vocational interests (Holland, 1997), social psychology (Aronoff & Wilson, 1985), and industrial and organizational psychology (e.g., Schneider, 1987). As such, although interests constitute one of the oldest and most widely researched aspects of fit (e.g., Parsons, 1909), compatibility between the individual and the environment has been operationalized by comparing personality, values, goals, and abilities as well (Kristof, 1996; Schneider, 2001). In addition, fit is often defined as the congruence between these characteristics in the individual and the environment.

As with Holland's theory, the basic idea in the P-E fit literature is that individuals not only prefer environments that are compatible with their own characteristics but that they also seek them out (Roberts, Caspi, & Moffitt, 2003; Roberts & Robins, 2004; Schneider, 1987). Theoretically, once individuals have entered an environment that they perceive to fit their characteristics, positive outcomes, including higher performance and longer persistence, will result. However, initial organizational or individual perceptions of fit may be inaccurate (Dickson, Resick, & Goldstein, 2008; Schneider, 1987). For example, employees may be attracted to an organization because of a perceived level of fit but may find that the organization is not what they expected after beginning their employment. Even when this occurs, employees may stay with the organization and try to change their job or their immediate environment to fit their interests (Roberts, 2006). Alternatively, interactions with the environment can change their interests and facilitate fit over time (Low, Yoon, Roberts, & Rounds, 2005). However, if fit remains unsatisfactory, employees may be less productive and/or may leave the organization altogether (Schneider, 1987). Thus, the extent of P-E fit can influence performance outcomes.

In general, past research has supported the theoretical link between P-E fit and performance. Kristof-Brown, Zimmerman, and Johnson's (2005) meta-analysis found that person–job fit (i.e., a specific type of P-E fit that focuses on similarities between the individual and his or her job rather than the environment as a whole) had a correlation of .20 on average with job performance and .18 with tenure in the organization. In the organizational literature, the broad domain of performance also includes organizational citizenship behaviors (OCB) and withdrawal or turnover. OCBs are behaviors that support the organizational, social, and psychological context that facilitates task activities and processes (Borman & Motowidlo, 1993). For example, these behaviors include helping others with their jobs, supporting the organization, and volunteering for additional work or responsibilities (Borman & Motowidlo, 1993). Empirical studies have also found that fit is associated with increased OCB (Cable & DeRue, 2002) and decreased withdrawal or turnover behaviors (Chatman, 1991; Saks & Ashforth, 1997). On the basis of this research, we expected that interest congruence, as a form of P-E fit, would correlate with job performance, organizational citizenship behavior, and withdrawal or turnover in a similar manner. On the basis of P-E fit research in the academic domain (Reutufors, Schneider, & Overton, 1979; T. J. G. Tracey & Robbins, 2006), we also expected interests to be related to academic achievement (e.g., grades, awards) and persistence in an academic program. Motivation theory provides one explanation for these relationships between interests and outcomes.

Motivation Theory

It is widely acknowledged that motivation is a critical direct determinant of performance (e.g., J. P. Campbell, 1990; J. P. Campbell et al., 1996; Sackett, Zedeck, & Fogli, 1988). Motivation is described as a set of internal processes that directs, energizes, and sustains behavior over time and across changing circumstances (Kanfer, 1990). In work settings, motivation drives performance through its influence on (a) the goals that are pursued and the activities that are chosen (direction), (b) the effort that is put forth (vigor), and (c) the time that is invested in the pursuit (persistence). Interests should be related to performance because they affect all three aspects of the motivational process. In other words, interests are not the same as motivation but can influence motivational processes, as described below. Figure 2 illustrates the relationships between interests, motivation, and performance.

First, interests are directional because they affect individuals' educational and occupational choices and focus effort on goal achievement in these domains. Interest has been found to be a robust predictor of choice of college majors and occupational membership (e.g., Eccles-Parsons, 1983; Fouad, 1999; Holland, Fritzsche, & Powell, 1994; Strong, 1943). Interests can also direct individuals' movement and progress within an occupation by influencing their preferences for certain activities. Employees may set goals, seek out training opportunities, or selectively focus on particular work activities to satisfy their vocational interests. For example, individuals with strong investigative interests may be attracted to the job of research scientist. If an individual simultaneously possesses enterprising interests, which involves influencing people, he or she may set a goal to be promoted to director of a research

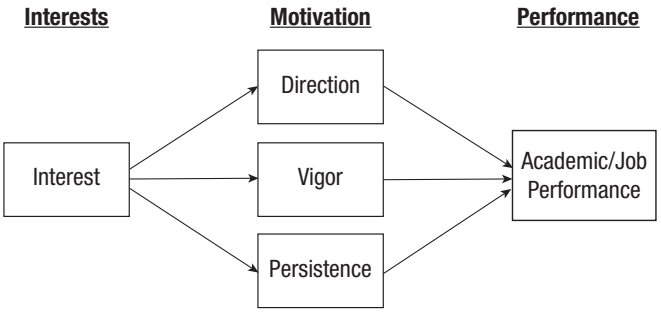

Fig. 2. Theoretical relationships between interests, motivation, and performance.

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department within 5 years, attend additional workshops or seminars on leadership and management, and concentrate on the interpersonal aspect of his or her work. By contrast, an individual lacking enterprising interests may turn away from such activities, focus solely on the research aspect of his or her work, and set goals for publications. Indeed, interests have been found to be important predictors of training success and promotion (correlated at .18 and .25, respectively; Hunter & Hunter, 1984).

Second, interest energizes efforts. Nearly a century ago, Dewey and other pioneers of functional psychology pointed out that interest is the key to effort in education. Dewey (1913) wrote that interest marks "an identification in action, and hence in desire, effort, and thought, of self with objects; namely, with the objects in which the activity terminates (ends) and with the objects by which it is carried forward to its end (means)" (p. 90). Dewey's statement suggests that interests not only direct choices but also lead to goal-striving effort—action to achieve objectives that one has chosen. Interests are also associated with increased effort in learning and development as well as at work (e.g., Renninger, Hidi, & Krapp, 1992; Van Iddekinge et al., 2011; Vroom & Deci, 1992).

Last, interest focuses attention and sustains pursuit. It entails an enthusiasm and a consciousness that persists during the interval between first encounter of a new percept and final attainment of the object (Herbermann, Pace, Pallen, Shahan, & Wynne, 1913). Thus, interest contributes to engagement in a task or commitment to a goal until the objective is achieved. When individuals' interests are compatible with the environment, they are more likely to stay in an occupation or persist with their major. Past research has consistently supported a positive association between interest congruence, longer occupational tenure (e.g., Gottfredson & Holland, 1990; Hunter & Hunter, 1984; Morris, 2003), and timely degree attainment (e.g., Allen & Robbins, 2010; Webb, Lubinski, & Benbow, 2002).

Interest Congruence and Performance

In the interest literature, a distinction can be made between the level (i.e., strength) of one's interests and the shape of his or her interest profile (i.e., pattern of interests). Studies focusing on the level of interests may correlate an interest score with a criterion and predict that higher (or lower) scores will lead to better performance. For example, when an elementary teacher's performance is defined by student achievement, his or her score on a social interest scale would be directly correlated with assessments of student performance. In contrast, researchers interested in the shape of the teacher's interest profile would focus on the magnitude of each of the six RIASEC types relative to the others and would correlate an index of this pattern (see below for further discussion of these indices) with student achievement.

Although interest level appears to be the most commonly used predictor of outcomes in empirical research (Prediger, 1998), the usefulness and validity of this practice has been questioned (Gottfredson & Jones, 1993; Hirschi, 2009; Prediger, 1998; Warwas, Nagy, Watermann, & Hasselhorn, 2009). Conceptually, there are two important reasons for the lack of validity for interest level. First, there is no reason to believe that a particular type of interest should predict performance across all occupations. In other words, a high score on social interests is not expected to predict performance in a realistic occupation, and vice versa. Consistent with Holland's (1997) theory, we would expect interests to predict performance only in the types of occupations for which that interest is relevant but not in others.Second, even if an individual has a high realistic interest, it may not predict performance in a realistic occupation if his/her realistic interest score is *relatively* low compared with his/her scores on other interest types. In other words, when interest scores are normed, the level of an individual's interest only reflects one's standing *in comparison with other individuals on that interest scale*; the interest profile, or the strength of an individual's interest on one scale *in comparison with his/her own interests on other interest scales*, may be the actual driver of the direction, amplitude, and endurance of the individual's effort and may, in turn, affect his or her performance. When discussing interest assessment, Cronbach (1984) suggested that if a person likes a certain type of work (compared with his or her interests in other types of work), it "makes no difference whether 50 percent or 90 percent of other persons would also like it" (p. 421). The person is likely to perform well on the work as long as this type of work is his or her favorite regardless of the level of interest.

Indeed, Holland's (1997) theory of P-E fit emphasized the pattern of interest profiles in the form of congruence. Instead of focusing on the level of a particular type of interest, Holland's theory suggests that the similarities between an individual's interest profile and the profile of his or her occupation should predict tenure and performance in academic and work domains. Figure 3 provides a diagram of the congruence concept in the work context. On the left of the figure is the interest profile for a hypothetical individual. In this example, the individual is most interested in enterprising activities that allow him or her to lead, persuade, and/or gain financially. The five other interest types are then listed below in order of decreasing strength. In other words, the individual's next highest scores are on the Social and Conventional Scales, respectively. As a summary, this interest profile is often represented by the first letters of the three strongest interests. In Figure 3, the three-letter code for the individual would be ESC.

A similar profile can also be developed for a particular occupation. The profile shown in Figure 3 is similar to that of a police officer. Police officers generally perform activities that correspond to realistic interests. However, enterprising and conventional activities also play a prominent role in this occupation. Thus, the three-letter code for the occupational environment in Figure 3 would be REC.

Because Holland (1997) emphasized the relationship between individual interests and the occupational environment,

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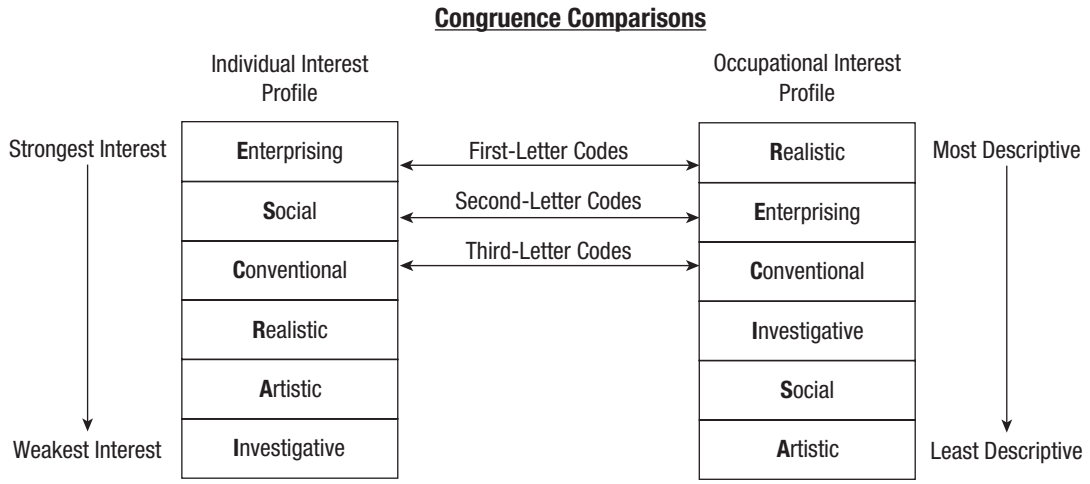

Fig. 3. The concept of congruence: An example. The first letters of each interest type are bolded because these letters are often used to summarize the profile. For example, the three-letter code for the individual profile is ESC, and the three-letter code for the occupational profile is REC.

the most popular congruence indices in the interest literature are based on the correspondence between these profiles (Brown & Gore, 1994; Camp & Chartrand, 1992). As shown in Figure 3, congruence is generally calculated by comparing the first three (or a subset of the first three) interest types in each profile, and similarities between individuals and their occupations are quantified by numerically weighting matches between interest and environmental characteristics. Most congruence indices can be differentiated by the weights that are used and how they are applied. A number of these congruence indices exist, but a full review of these measures is beyond the scope of the present study.[2] However, it is important to note that although the calculation of these indices varies, each provides a single score that quantifies an individual's fit with an environment based on his or her pattern (i.e., profile) of interest scores. Thus, given the link between Holland's theory and congruence, we hypothesized that these indices would have higher meta-analytic validities than interest scores alone.

One form of congruence merits particular attention because of its prevalence in and importance for the interest literature. This type of congruence is determined by matching an individual's strongest interest to the interest type that best describes his or her occupation. This form of congruence does not involve the numerical weighting or quantitative formulation that is used in other congruence indices. Instead, it focuses on identifying the four categorical levels of similarity defined by Holland (1997) and illustrated in Figure 1: match, adjacent, alternate, and opposite. If an individual is most interested in a social type of work, then social occupations, such as teaching and counseling, would provide a match for that individual; occupations with a Holland type adjacent to social would provide a less satisfactory match; occupations with an alternate Holland type would be an inadequate match; and occupations with an opposite Holland type would be a poor fit for the individual. These degrees of congruence provide a straightforward evaluation of P-E fit and are likely to impact how strongly interest scores are related to performance.

It is important to note that these four categories of similarity are an essential part of Holland's (1997) theory. Holland operationalized congruence using these categories and many of the quantitative indices alluded to earlier are based on them. Therefore, evaluating the validity of this form of congruence is important for understanding the implications of Holland's theory for predicting performance. Consequently, we also examined this form of congruence and predicted that matching or adjacent interests would be better predictors of performance than alternate or opposite Holland types because they reflect higher levels of fit.

The Present Study

Given the psychological theories that suggest that interests should predict performance outcomes in work and academic contexts, the present study attempts to provide a comprehensive review of the literature and to elucidate the relationship between interests and performance. A secondary purpose of this study was to examine the research conditions that might affect the interest–performance relationship. In other words, we sought to identify moderators of the meta-analytic correlation.

First, although nearly all vocational interest inventories were developed in academic contexts for providing vocational guidance, each of these inventories differs in its approach to the measurement of interests. For example, the Self-Directed Search (SDS; Holland, Fritzsche, & Powell, 1994) and the Vocational Preference Inventory (VPI; Holland, 1965) were developed to assess Holland's six broad RIASEC types. In contrast, the Kuder Preference Record (KPR; Kuder, 1983) assesses more specific constructs known as basic interests (e.g., mechanical, scientific, artistic, and clerical interests), and some versions of the Strong Interest Inventory (SII; Harmon,

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Hansen, Borgen, & Hammer, 1994) measure interests by using basic interest and empirically keyed occupational scales. Because others have provided thorough reviews of the similarities and differences between the various interest measures (Borgen, 1986; Rounds, 1995), we do not provide a full review here. However, given their different approaches to the measurement of vocational interests, we expected that the validities of these inventories may differ as well.

Because Holland's theory suggests that performance will improve when an individual's interests match the tasks in a particular environment, we also examined the occupational and academic homogeneity of the sample used to estimate the interest–performance correlation. On the basis of Holland's theory, one would not expect a particular scale (e.g., a realistic scale) to predict performance across a broad range of occupations or academic majors. Therefore, when studies correlate performance with only one of the interest scales, this relationship may be attenuated if examined across multiple occupations with different interest profiles because the interest type that is measured will not match each of these occupations. Similar results are likely in samples from multiple academic majors.

Longitudinal studies and research assessing performance with objective measures (e.g., quantity produced or sales) may also have smaller correlations than cross-sectional studies and subjective performance criteria. Consistent with past research, validities tend to decrease as the length of time between collecting the predictor and the criterion scores increases (e.g., Alvares & Hulin, 1973). In addition, because of the greater potential for criterion contamination and deficiency, studies predicting objective criteria may find lower correlations than when subjective performance criteria are used (Borman, 1991). As a result, we expected the correlation to be lower in longitudinal studies and research using objective criteria as the outcome.

Finally, Holland's (1997) theory is not limited to either work or academic settings. Thus, we expected interests to predict performance in both of these areas, and therefore, we examined the validity in each. However, despite the similar predictions made by Holland's theory for each setting, it is possible that the magnitudes of the relationships will differ in each of these environments. Consequently, we examined the meta-analytic correlations separately in work and academic contexts.

Method

Literature search

To identify studies for the present meta-analysis, we searched in the American Psychological Association's PsycINFO database (1887–2010) and Google Scholar for the terms *interests, vocational interests, job performance, occupational interests, RIASEC, interest congruence, academic achievement*, and *turnover*. The technical manuals for each of the major interest inventories, including the KPR (Kuder, 1983), the SII (Harmon et al., 1994), the SDS (Holland et al., 1994), the VPI (Holland, 1965), the ACT Interest Inventory (American College Testing Program, 1995), and the Career Assessment Inventory (CAI; Johansson, 1984), were also searched for citations and studies that could be incorporated. In addition, we examined seminal books by prominent researchers on vocational interests (e.g., D. P. Campbell, 1971; Strong, 1943) and contacted several authors for additional studies and unpublished works. Next, we explored the references from each available article examining the relationship between interests and performance and all relevant reviews to identify additional studies. From these searches, we identified and examined a total of 124 articles for inclusion in our analysis.

Overall, 60 (42 employed and 18 academic samples) usable studies were identified, with sample sizes ranging from 25 to 1,390 and a total sample size of 15,301 ($N = 9,472$ in employed samples and 5,829 in academic samples). The references for these studies are provided in the reference list, and further information on the inclusion criteria used to identify them is provided in the Appendix. Publication dates for these studies ranged from 1942 to 2011, and nearly 48% of these studies ($k = 29$) were conducted after Hunter and Hunter's meta-analysis in 1984. Approximately 52% ($k = 31$) of the studies were longitudinal, and 76% of the studies examined interest level rather than congruence indices.

Analyses

For the present analysis, a total of 568 correlations were obtained from the 60 usable studies identified in the literature search. Each of these correlations was corrected for both indirect range restriction and unreliability in the criterion measures using the methods proposed by Hunter, Schmidt, and Le (2006). These correction techniques and their application to the present study are described more thoroughly in the Appendix.

Because several correlations were reported in a number of the studies that we reviewed, many of these correlations violated the statistical assumption of independent observations. Therefore, we used a regression-based approach to meta-analysis (see Beaty et al., 2011, and Richman, Kiesler, Weisband, & Drasgow, 1999, for examples of previous applications of this approach) that allows for dependent observations and, therefore, can incorporate the entire set of correlations obtained in a particular study. Additional information about this approach and its application in the present study are provided in the Appendix.

Results

In both the academic and employed samples, we found that interests were moderately correlated with performance and persistence at work and in school. Thus, these results contradict previous research suggesting that interests are only weak predictors of performance. In addition, consistent with

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Holland's (2007) theory, congruence indices were found to be stronger predictors of performance criteria than interest scores alone. Below we describe the results of our analyses, first for the employed samples and then for academic studies. Additional details about our analyses and the regression models we estimated are provided in the Appendix.

Interest–performance correlations in employed samples

Results indicated that interests have a significant relationship with performance in the work setting. The baseline estimate of the meta-analytic correlation between interests and performance was .20, suggesting a moderate relationship between interests and performance. This is important because it suggests that those who obtain higher interest scores tend to be better performers even when the degree of congruence between the individual and the occupation is not considered. In addition, this meta-analytic value is also substantially higher than the corrected correlation (.10) reported by Hunter and Hunter (1984) or the zero-order correlations (ranging from −.08 to .10) estimated by Van Iddekinge et al. (2011).

Consistent with our hypothesis, congruence coefficients had significantly higher correlations when congruence indices were used. The meta-analytic baseline estimate of the relationship between congruence indices and performance was .36, which was .16 larger than when interest scores alone were used.

Table 1 provides the estimated correlations between interests and each of the performance criteria for both scale scores and congruence indices. Again, this table shows that, across a range of performance criteria and different interest inventories, congruence indices are always better predictors when compared with interest scale scores. Congruence indices had substantial correlations with task performance, OCB, and persistence. In other words, interested employees are likely to perform better, help others in the organization, and stay with the company longer. In contrast, interest congruence was not a strong predictor of counterproductive work behavior (CWB). The correlations between congruence and CWB ranged from −.01 to −.10, meaning that employees with interests that are congruent with their environment were slightly less likely to engage in deviant behavior at work. Although the direction of this relationship was expected, the magnitude of the correlation suggested only small effects.

Table 1. Meta-Analytic Corrected Correlations Between Interests and Performance in the Employed Samples

	Task performance		OCB		Persistence[a]		CWB[b]	
Moderators	Scale score	Congruence Index	Scale score	Congruence index	Scale Score	Congruence index	Scale score	Congruence index
Interest scale								
Self-Directed Search	.05	.21	.10	.26	.05	.21	.15	−.01
Vocational Preference Inventory	.10	.26	.15	.31	.10	.26	.10	−.06
Kuder Preference Record	.06	.22	.11	.27	.06	.22	.14	−.02
Strong Interest Inventory	.11	.27	.16	.32	.11	.27	.09	−.07
Other inventories[c] (e.g., homegrown)	.14	.30	.21	.37	.14	.30	.06	−.10
Study characteristics								
Cross-sectional studies[c]	.14	.30	.21	.37	.14	.30	.06	−.10
Longitudinal studies	.12	.28	.19	.35	.18	.34	.08	−.08
Subjective criteria[c]	.14	.30	.21	.37	[a]	[a]	.06	−.10
Objective criteria	.08	.24	.15	.31	.14	.30	.12	−.04
Single occupation examined[c]	.14	.30	.21	.37	.14	.30	.06	−.10
Multiple occupations examined	.08	.24	.15	.31	.08	.24	.12	−.04

Note. All values represent the estimated correlations corrected for indirect range restriction and attenuation in the criterion. OCB = organizational citizenship behavior; CWB = counterproductive work behavior.

[a]Because the measures of persistence were all objective, correlations were not estimated for subjective persistence measures.

[b]The signs of the predicted correlations have been reversed back to their original direction (see Appendix for additional details). As such, negative correlations with congruence indicate that individuals who are more interested in their jobs will engage in less counterproductive work behavior.

[c]Using the regression-based approach to meta-analysis, these correlations represent the baseline estimates of the meta-analytic correlations (see the Appendix for additional details). As such, the baseline correlations represent the relationships between interests and performance in employed samples when the data are cross-sectional, the samples are from a single occupation, and subjective measures of performance (e.g., supervisory ratings) are used as the criteria.

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Our results also suggested that most of the moderator variables we examined did not have a substantial impact on the magnitude of the interest–performance correlation. As illustrated in Table 1, there was only slight variation among the meta-analytic correlations with commonly used interest inventories. In general, the SDS and KPR had the smallest correlations with performance of any of the scales. However, even these correlations did not differ substantially from the others. As expected, longitudinal studies had slightly smaller correlations than cross-sectional designs. However, this moderation effect was small, and the correlations between interests and performance were still substantial for studies with longitudinal designs. For example, the correlations between interest congruence and task performance, OCB, and persistence were still .28, .35, and .34, respectively, in longitudinal studies. Studies using subjective performance measures had significantly higher correlations (e.g., the correlation between congruence and subjectively measured task performance was .30) than research with objective measures (e.g., the correlation between congruence and objectively measured task performance was .24). This result appears consistent with other research finding lower correlations with objective criteria (Beaty et al., 2011). Finally, studies examining samples from a single occupation had slightly higher correlations than research on samples from multiple occupations.

Again, it is worth noting that the correlations with all criteria were significantly larger when congruence indices were used. Based on Holland's theory, using a particular interest scale (e.g., Enterprising) to predict performance in a broad range of occupations is inappropriate, and therefore, higher interest–performance correlations should be obtained when the interest measure is congruent with the occupation. Nevertheless, Table 1 also shows that interest scores alone can have modest correlations with performance criteria. Because these relationships are based on correlations between interest scale scores and performance in a broad range of occupations, these results were unexpected. However, it is possible that the modest size of the meta-analytic correlations was inflated by the number of studies using interest scales that matched the occupations for which that behavior was predicted. We examined this potential explanation in a subset of the data.

Matching individual interests to the occupation

Congruence can be operationalized as the match between an individual's interests and his or her occupation. Therefore, using Holland's framework and the diagram in Figure 1, we categorized each of the correlations in our meta-analysis on the basis of the similarities between the first-letter RIASEC code of the occupation (Rounds, Armstrong, Liao, Lewis, & Rivkin, 2008) and the type of interests measured. When the interest type was the same as the first-letter code for the occupation, it was coded as a match. For example, if a particular study assessed realistic interests in a sample of mechanics (i.e., a realistic job), then the correlation was categorized as a match. Correlations were also coded for interests and environments, with adjacent (e.g., realistic and investigative) and alternate (e.g., realistic and artistic) positions on the perimeter of Holland's hexagon. This form of congruence is what Holland (1997) originally conceptualized when formulating his theory, and we examined it here using a separate analysis of the studies in our database. After excluding missing data (see Appendix), this analysis was based on 22 independent studies and 281 correlations. The results showed that the interest–performance correlations were larger when the interest measure used to predict performance matched the first-letter code of the occupation.

The meta-analytic baseline correlation between interests and performance was .27 when the scale used to measure vocational interests matched the first-letter code of the occupation (see the Appendix for additional details). Similarly, adjacent interests and occupations exhibited a meta-analytic baseline correlation of .23. In other words, assessing interests that match the characteristics of the occupation or are closely associated with them (in terms of Holland's hexagonal model) will provide moderate prediction of performance at work. Thus, these results provide additional evidence for the importance of congruence but operationalize congruence as a match between individuals and their environments rather than as a quantitative index of their similarities.

As might be expected, correlations between alternate (e.g., realistic and artistic) and opposite (e.g., realistic and social) interests and occupations were substantially smaller than when individuals and environments matched. On average, these correlations were .15 and .21 smaller, respectively, than correlations in matching interests and occupations. These results are consistent with Holland's theory and suggest that studies that simply correlate interest scores with performance, without any consideration of which interest types should be related to performance in the job being evaluated, will find lower correlations with the criterion. This is one possible explanation for the low correlations that were found in previous meta-analytic studies of the interest–performance relationship.

Interest–performance correlations in academic samples

Our analyses in the academic samples also indicated that interests were significantly correlated with academic performance. In these analyses, the baseline correlation was .23. In addition, correlations between congruence indices and academic performance were substantially higher (e.g., the meta-analytic baseline correlation was .32). Thus, consistent with the results in the work domain, interests are moderate predictors of academic performance, and the relationship is particularly strong when the congruence between the individual and his or her environment is considered.

Because of a lack of information (i.e., correlations), the criteria and the moderators we examined in the academic

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samples were slightly different than in the work domain. First, very few studies used the VPI or the KPR in an academic sample. However, in contrast to the work sample, a sufficient number of studies did use the CAI. Thus, the CAI was examined as a moderator of the interest–performance correlation. For the criteria, we examined only persistence in an academic major and grades. Objective performance measures (e.g., objective measures of student achievement), longitudinal research designs, and samples from diverse academic backgrounds were also examined as moderators in these analyses.

As shown in Table 2, interests were correlated with both persistence and grades when congruence indices were used. For most inventories, interest scores alone were also substantially correlated with these criteria but were .09 lower than the corresponding relationships with congruence indices on average. Therefore, it appears that students who are interested in the subjects that they are majoring in are more likely to remain in the program and to get good grades. Unfortunately, there were too few studies to run additional analyses examining Holland's concept of congruence as the match between interest scores and the academic–environmental profile.

In terms of moderators, some factors had a substantial effect on the magnitude of the interest–performance correlation. For example, the SII had a smaller correlation with performance than did other scales in our meta-analysis. On average, correlations between the SII and performance were .19 lower than for other scales, meaning that this inventory is less predictive of academic performance. Similarly, the interest–performance relationship in samples of multiple academic majors was significantly smaller than the correlations observed in groups from a single major. Even when using congruence indices, correlations with persistence and grades were .20 and .16, respectively, when estimated in these academically diverse samples. In other words, studies using participants from a variety of majors generally observed correlations between interests and performance that were .14 lower than the corresponding correlations observed in studies from a single academic program. The other moderators examined in the academic samples had only small effects on the magnitudes of the correlations.

Discussion

The present study provides a quantitative summary of 60 studies, 568 correlations, and over 60 years of research. Overall, the results from this meta-analysis suggest that interests are valid predictors of performance in academic and work domains. These findings contradict previous research that suggested that the correlation between interests and performance is negligible. Moreover, these results support Holland's (1997) hypothesis regarding congruence and suggest that the correspondence between the individual and his or her environment is important for predicting performance outcomes.

Our results are also consistent with previous research identifying the benefits of examining interest profiles rather than interest levels (e.g., Gottfredson & Jones, 1993; Prediger, 1998). However, the present study departs from previous research suggesting that interest scores have "little useful information" (Gottfredson & Jones, 1993, p. 47). This study

Table 2. Predicted Values for the Corrected Correlations Between Interests and Performance in the Academic Samples

	Persistence		Grades	
Moderators	Scale score	Congruence index	Scale score	Congruence index
Interest scales				
Self-Directed Search	.26	.35	.22	.31
Career Assessment Inventory	.20	.29	.16	.25
Strong Interest Inventory	.03	.12	−.01	.08
Other inventories[a] (e.g., homegrown)	.22	.31	.18	.27
Study characteristics				
Cross-sectional studies[a]	.22	.31	.18	.27
Longitudinal studies	.26	.35	.22	.30
Subjective criteria[a]	—	—	—	—
Objective criteria	.22	.31	.18	.27
Single major examined[a]	.22	.31	.18	.27
Multiple majors examined	.11	.20	.07	.16

Note. All values represent the correlations corrected for indirect range restriction and attenuation in the criterion. Because measures of persistence and grades were all objective, correlations were not estimated for subjective criteria, as denoted by the dashes throughout this row.
[a]Using the regression-based approach to meta-analysis, these correlations represent the baseline estimates of the meta-analytic correlations (see the Appendix for additional details). As such, the baseline correlations represent the relationships between interests and performance in academic samples when the data are cross-sectional, the samples are from a single academic major, and subjective measures of performance (e.g., ratings of student achievement) are used as the criteria.

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shows that interest scores have modest correlations with some performance criteria. Still, the supplementary analyses suggest that these modest correlations are at least partially due to the significant effects of matching the interest scale and the occupation or academic major being examined. Thus, choosing an interest scale to predict performance in a particular occupation or major should involve considering the interest profile of that particular environment.

Despite the positive results for congruence indices, they have been criticized for various reasons. For example, Tinsley (2000) criticized these indices and Holland's theory on the grounds that they do not predict organizational outcomes. However, this critique was based on a meta-analysis conducted in 1987 (Assouline & Meir, 1987) and has been criticized itself for its arguments (Rounds, McKenna, Hubert, & Day, 2000). Edwards (1993) has questioned the use of profile similarity indices more generally. Although the congruence indices that are generally used in interest research do not necessarily have the same issues as the indices criticized by Edwards, several of the limitations he described are salient here. For example, congruence indices in the interest literature obscure important information about the characteristics being examined and reduce a multidimensional problem to a single index. Consequently, results may be difficult to interpret, and inappropriate conclusions may be drawn. To remedy these problems, Edwards (1993, 2002) has suggested using polynomial regression as an alternative to indices of fit. However, we are unaware of any studies using this approach to examine relationships in the interest literature. Therefore, future research should explore the use of polynomial regression as a way to compare interest profiles.

Implications

Substantively, the present results have important implications for employee selection. Because of the low correlations identified in previous research, interest measures have generally been ignored in the employee selection process (Van Iddekinge et al., 2011). However, the present study suggests that interests can be important predictors of performance on the job and may have criterion-related validities as high as or higher than other nonability predictors (e.g., personality; Barrick & Mount, 1991; Hurtz & Donovan, 2000). In the context of employee selection, organizations often administer test batteries or other selection measures to identify the applicants that are likely to perform well in the job. The results presented here indicate that interest measures may be useful additions to these selection systems. In other words, organizations can assess applicants' interests and hire only those individuals that will fit the best with the job they are applying for. Obviously, the utility of this selection process requires that organizations have an accurate picture of the interest profile for the job that they are hiring for. When an appropriate match can be identified, our findings indicate that congruent employees are more likely to be motivated to perform work tasks and persist when these tasks become difficult. Conversely, applicants with interests that do not correspond to the work environment will be lower performers and will be more likely to leave the organization.

Despite the positive results for predicting other workplace behaviors, interests were not strong predictors of CWBs. It is possible that CWBs are less likely to be guided by the motivational processes we ascribe to interests. Previous research suggests that employees may engage in CWB as a consequence of a perceived wrong (Andersson & Pearson, 1999) or as a way to gain or maintain power (Berdahl, 2007). If this is the case, then the congruence between an individual's interests and the environment would not be expected to have an impact on the perpetration of these behaviors.

Interests were moderate predictors of academic performance. Thus, interests may also be useful for college admissions when used to identify applicants with interests in a particular major. Similar to the employee selection context, interest scores can be used to identify the applicants that are most congruent with the academic program that they are applying for and, in conjunction with other selection criteria (e.g., SAT or GRE scores), to make admission decisions. At this point, interests are used extensively to provide career guidance to students (Holland, 1997; Strong, 1943) but are not generally used in academic admissions. The present study shows that interests may be useful in this context. However, some research has shown that there are consistent mean-level differences between demographic groups (Jones, Newman, Su, & Rounds, 2010; Su et al., 2009). Therefore, factors that can reduce these differences will need to be considered to reduce adverse impact (cf. Su et al., 2009).

Limitation and future directions

The present meta-analysis provides a comprehensive review and evidence for a substantial relationship between vocational interests and performance. Aside from addressing questions related to the magnitude of the interest–performance correlation, we also attempted to identify moderators of this relationship, including interest congruence, work versus academic samples, and the type of performance criteria. Nonetheless, there may be other important moderators that were not included in this meta-analysis because insufficient information was available. For example, past research has shown that there are mean-level differences in vocational interests between demographic groups (e.g., race and sex; Jones et al., 2010; Su et al., 2009). Because group-specific correlations were not provided in the majority of the studies we analyzed, we could not address this issue in the present study. Therefore, future research could help to determine whether there are also differences in the interest–performance relationship across gender and racial or ethnic groups.

Another issue for future research is related to the assessment of measured versus expressed interests. Measured interests were the focus of the present study and consist of responses to interest inventories. In contrast, expressed interests are

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more explicit: Respondents simply indicate what career they intend to enter. Despite the conceptual similarities between expressed and measured interests, Silvia (2001) provided a compelling argument that they represent separate constructs. Measured interests are represented by scores from vocational interest inventories, and expressed interests are analogous to behavioral intentions in the attitude literature (cf. Ajzen & Fishbein, 1977). For this reason, expressed interests were not included in this meta-analysis. However, past research has shown that expressed interests have substantial validity for predicting vocational choice (Dolliver, 1969; Spokane & Decker, 1999). Therefore, it is possible that expressed interests may also translate into performance. Future research should address this issue to more fully understand the role of expressed interests in work and academia.

Last, more research is needed on the relations between vocational interests and other important criteria (e.g., job satisfaction, career development). Because past research has indicated that interests are not strong predictors of performance (Hunter & Hunter, 1984), vocational interests have seemingly been ignored in selection contexts, and the need for additional research in this area was particularly salient. However, interests have also been hypothesized to predict job satisfaction and vocational choice (Holland, 1997). Therefore, meta-analytic summaries of these relationships may be warranted in future research.

Conclusion

In contrast to previous meta-analytic research, the results reported here show that interests can be significant predictors of performance outcomes. As expected, the congruence between an individual's interests and the characteristics of the environment was particularly important. However, even interest scores alone can be useful predictors of performance when the scale used to measure them is carefully chosen to correspond to the occupation or major that an individual will enter. Overall, interests were shown to predict task performance, organizational citizenship behavior, grades, and persistence in work and academic contexts.

Appendix

This appendix provides additional information about the methodology used in this study. We also provide more specific technical details about our results and the calculations that we used to obtain them.

An example of congruence

Figure 3 in the main text illustrates how congruence indices are generally calculated by comparing the first three (or a subset of the first three) interest types in individual and occupational interest profiles. Measures of congruence can be differentiated by how these comparisons are used to form an index. For example, one popular congruence index, Iachan's (1984) *M,* is calculated by comparing the first three letters in an individual's interest profile to the corresponding three-letter environment code. Each letter is then assigned a particular weight, which was designated by Iachan (1984) and based on the location of the letter in the profile. For example, if an individual's first-letter code matches the first-letter code for the environment, Iachan suggested using a weight of 22 (weight = 0 if the first-letter code does not match any of the environmental codes). The weights for each letter are then summed to create an overall index of congruence that ranges from 0 to 28.

Inclusion criteria for the meta-analytic database

Articles were included in this meta-analysis if sufficient information was available to calculate a correlation between at least one of Holland's (1997) six interest types and an assessment of performance in an occupational or academic domain. Because we hypothesized that congruence measures would affect the magnitude of the relationship, studies examining correlations between these indices and performance were also included. We categorized scales that were not developed under Holland's framework into one of the RIASEC types by using the correspondence tables provided by Su, Rounds, and Armstrong (2009, pp. 866–867). Using extensive procedures for making comparisons, these authors classified scales from commonly used interest inventories into their corresponding RIASEC type. Interested readers are referred to the original article for a description of the processes used to make these categorizations (see p. 864).

In some cases, several scales used in a particular study corresponded to a single interest type in Holland's (1997) framework. For example, both the Health Services Scale and the Educational Services Scale in the Career Interest Inventory (Psychological Corporation, 1991) reflect the social interest category in Holland's framework. These data were problematic when using Holland's framework for our study because there is not a single correlation that represents the relationship between a scale and the criterion. In these situations, where multiple scales assessed a single Holland type, the average correlation across the constituent scales was used for our analysis.

With regard to the criterion, we used a broad conceptualization of performance that is consistent with its multidimensional nature as articulated by J. P. Campbell (1990) and others (e.g., Harrison, Newman, & Roth, 2006). An article was included if it assessed task performance, organizational citizenship behavior (OCB), turnover or other forms of withdrawal, or counterproductive work behaviors (CWBs). Because we were also interested in academic performance, studies examining grade-point average (GPA), persistence in a particular academic major, and academic achievement were also included.

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The broad inclusion criteria used here provided several important advantages for this meta-analysis. First, incorporating more studies into our analysis provided a more comprehensive picture of the relationships among interests and performance. In particular, examining a broader conceptualization of performance provided a clearer picture of the differential relationships between interests and the various behaviors in the performance domain than had been identified in previous research. Moreover, the analytic approach used in this study facilitated the quantitative combination of studies with diverse characteristics. Thus, including more of the available studies provided additional information that could be modeled using the techniques described below to identify the influence of study characteristics.

Correcting for statistical artifacts

The correlations obtained from the studies included in this meta-analysis were corrected for both unreliability in the criterion and indirect range restriction. Although meta-analytic correlations like those examined here are most frequently corrected for direct range restriction, Hunter, Schmidt, and Le (2006) showed that this is inappropriate and that correcting for indirect range restriction will provide more accurate validity estimates. Indirect restriction occurs when selection is based on a variable other than the predictor. In many of the studies identified for this meta-analysis, job incumbents had already been selected into the organization on the basis of other criteria. Although individuals may still have self-selected into these roles, the range restriction that resulted would not be based on observed interest scores. Any range restriction due to self-selection would be indirectly related to observed scores on the interest measure. Therefore, we used the procedures described by Hunter et al. (2006) to correct for indirect range restriction.

Because indirect range restriction is based on true scores rather than observed test scores with measurement error, observed correlations must first be corrected for unreliability (Stauffer & Mendoza, 2001). Although it is common in validity generalization studies to estimate the operational validity by correcting for unreliability only in the dependent variable, correcting for unreliability in the predictor is also necessary for estimating the extent of indirect range restriction (Hunter et al., 2006). However, after correcting for indirect range restriction, the unreliability in the predictor was reintroduced to obtain an estimate of the operational validity.

If available, reliability estimates from the original studies were used for corrections. When reliabilities were not reported in the original study, meta-analytic estimates of the reliability of performance were used. To correct for unreliability in subjective evaluations of performance, we used a reliability estimate of .60 (Conway & Huffcutt, 1997) and a value of .61 to correct for unreliability in objective performance measures (Sturman, Cheramie, & Cashen, 2005). Objective measures of performance that were unlikely to be affected by test–retest reliability, interrater reliability, or intrarater reliability (e.g., actual turnover, salary, GPA) were assumed to be perfectly reliable. If the reliability of an interest measure was not reported in the original study, the estimate provided in the technical manuals was used if it was available. In all other cases, the average reliabilities for the predictor and the criterion across all studies (.87 for both) were used to correct correlations. Because these estimates of reliability were obtained from both restricted (e.g., those reported in the original studies) and unrestricted (e.g., meta-analytic estimates of reliabilities or estimates from norming samples) samples, it was necessary to put each estimate on the same level (i.e., the restricted level versus the unrestricted level). Therefore, we applied the equations provided by Hunter and Schmidt (2004) and Hunter et al. (2006) to make these transformations.

After correcting for unreliability, we corrected correlations for indirect range restriction following the procedures described by Hunter et al. (2006). For these corrections, we obtained the restricted standard deviations from the estimates reported in each study whenever they were available. For the unrestricted estimates, we obtained the standard deviations from the norming samples reported in the technical manual for each inventory.

When the restricted standard deviations were not reported in the primary study, the average standard deviation ratio across all studies with a similar level of person–environment agreement was used. For example, if a particular study used a realistic scale to predict performance in a realistic occupation, we would correct the correlation for range restriction by taking the average standard deviation ratio across all studies that matched the interest scale to the first-letter code of the environment. Because individuals are most likely to select occupations that they believe match their interests, the range of scores should be more restricted when the interest scale matches the first-letter code of the environment. Similarly, interests and environmental codes that are opposite each other (e.g., realistic and social interests in Figure 1) should also be highly restricted because few individuals will choose a position or academic program that is contrary to their interests. In contrast, interest scores and environmental codes that are adjacent (e.g., using a realistic scale to predict performance in an investigative job) or alternate to each other (e.g., realistic interests and an artistic job) on the hexagon should be less restricted. In all cases, we identified the first-letter code of the environment being examined by using the interest profile provided for similar occupations on O*NET (U.S. Department of Labor, 2011).

When calculating the standard deviation ratios, we found that there was an insufficient number of studies with alternate interests and environmental codes to calculate an average standard deviation ratio for this group. Therefore, we used the overall average standard deviation ratio across all studies and correlations. As a result, the mean standard deviation ratios for matching, adjacent, alternate, and opposite interest and environmental codes were .86, .92, .89, and .85, respectively. Thus,

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the range of interest scores was restricted as expected (i.e., matching and opposite scores were the most restricted, and adjacent or alternate were the least restricted). Because estimates of the unrestricted standard deviations for congruence indices have not been estimated in norming samples, these correlations were not corrected for range restriction.

Analyses

Many studies in the interest domain report correlations between two or more of the six RIASEC interest types and a performance criterion. When several correlations are reported in a single study, the standard statistical assumption of independent observations is violated, making statistical significance tests and confidence intervals inappropriate for these data. Thus, with the traditional Hunter–Schmidt method of meta-analysis (Hunter & Schmidt, 2004), several correlations from a single study would be averaged together to mitigate the effects of dependent observations, and the mean correlation would be used for the analysis. However, this process limits the amount of information used in the analysis. Instead of using all of the 568 correlations obtained for this study, only 60 correlations would be analyzed. For this reason, some studies have used a regression approach that allows for dependent observations (Beaty et al., 2011; Richman, Kiesler, Weisband, & Drasgow, 1999) and, therefore, can incorporate the entire set of correlations obtained in a particular study. Because of the large number of dependent observations that we identified in our literature search, we used a similar approach here.

The regression model used in the present study is commonly applied in the survey sampling literature when the sampling unit (e.g., farms in the United States) consists of a number of smaller subunits (e.g., farms of different sizes in the United States; Cochran, 1977). With this technique, the dependence between subunits is explicitly modeled, and the standard errors of the parameter estimates are corrected for its effects (Shah, Barnwell, & Bieler, 1995). Thus, this method provides more accurate standard errors and statistical tests than ordinary least squares regression. It is interesting to note that the estimates of regression coefficients are unaffected by clusters of dependent observations (Shah et al., 1995)—only the standard errors of the estimated coefficients are changed.

To conduct the regression-based meta-analysis, we first corrected correlations from our database of studies for both indirect range restriction and unreliability in the criterion measures by using the methods described above. Next, these corrected correlations were used as dependent variables in a regression model. The independent variables in this equation were the study characteristics that we hypothesized would moderate the magnitude of the corrected correlations. In other words, we created dummy-coded variables for each of the predictors shown in Tables A1 and A3. For each study, the variable was coded 1 if the predictor was included and 0 otherwise. For example, if a particular study used the Self-Directed Search (SDS), then $D_1 = 1$, and $D_2 = 0$ for the Vocational Preference Inventory (VPI), $D_3 = 0$ for the Kuder Preference Record (KPR), and $D_4 = 0$ for the Strong Interest Inventory (SII). The corrected correlations were then regressed onto these dummy variables, and the regression weights were estimated. For example, the following regression equation was estimated in the employed samples:

$$\begin{aligned}\rho = {} & b_0 + b_1\,(\text{SDS}) + b_2\,(\text{VPI}) + b_3\,(\text{KPR}) + b_4\,(\text{SII}) + \\ & b_5\,(\text{task performance}) + b_6\,(\text{OCB}) + \\ & b_7\,(\text{persistence}) + b_8\,(\text{CWB}) + \\ & b_9\,(\text{objective criteria}) + b_{10}\,(\text{multiple positions}) + \\ & b_{11}\,(\text{congruence}) + b_{12}\,(\text{longitudinal}),\end{aligned}$$

where ρ is the corrected correlation, b_0 is the intercept, and b_1 through b_{12} are the regression weights for the study characteristics. This notation is also provided in Table A1 to help clarify our results.

The intercept of this regression model (i.e., b_0) represents the mean correlation across all of the studies that we analyzed before taking into account the study characteristics. In other words, before knowing any other information about a study, we would predict the correlation between interests and performance to be the intercept of the regression model. In

Table A1. Parameter Estimates From the Regression Model for the Employed Samples

Predictors	Regression coefficient	*SE*
Intercept (b_0)	.20*	.06
Interest scale		
Self-Directed Search (b_1)	−.09*	.04
Vocational Preference Inventory (b_2)	−.04	.06
Kuder Preference Record (b_3)	−.08*	.04
Strong Interest Inventory (b_4)	−.03	.04
Criterion		
Task performance (b_5)	−.06	.03
OCB (b_6)	.01	.04
Persistence (b_7)	.00	.04
CWB (b_8)	−.26*	.04
Methodological characteristics		
Objective criterion (b_9)	−.06*	.03
Multiple position examined (b_{10})	−.06	.03
Congruence index (b_{11})	.16*	.04
Longitudinal study (b_{12})	−.02	.03

Note. $R = .36$, $R^2 = .13$, and adjusted $R^2 = .10$. Each of the meta-analytic correlations (i.e., the dependent variables) were corrected for both indirect range restriction and unreliability in the criterion before estimating the regression model. The regression coefficients presented here are the unstandardized coefficients from the model regressing the meta-analytic corrected correlations onto the dummy variables for each of the predictors shown here in the work samples. OCB = organizational citizenship behavior; CWB = counterproductive work behavior.
*$p < .05$.

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contrast, the regression weights for the study characteristics indicate the extent of their effects on the correlation. For example, a significant positive regression coefficient for congruence indices would suggest that studies using these indices have significantly higher meta-analytic correlations than studies using interest scores alone. Thus, using these parameters (i.e., b_0, b_1, b_2 . . . b_{12}), we can calculate the predicted regression scores under various study conditions, and these scores will represent the meta-analytic validities under those conditions. In addition, because of the dependent observations (i.e., multiple correlations from a single study), the standard errors of the parameter estimates will be more accurate using the clustered regression technique that was applied here (Shah et al., 1995).

Note that the correlations for counterproductive work behavior were recoded in the positive direction for inclusion in this analysis. Similarly, correlations with turnover were recoded in the positive direction and termed persistence. This was done because including negative correlations in the regression would have introduced greater complexity in interpreting the magnitude of the relationship between interests and performance.

Using this meta-analytic approach, we based the regression models on 417 and 151 observations (i.e., corrected correlations) in the work and academic samples, respectively. To evaluate the probability of detecting significant effects with this database, we calculated power by using the G*Power 3.1 computer program (Faul, Erdfelder, Buchner, & Lang, 2009), which implements the procedures described by Cohen (1988). Given the number of correlations, the power to detect a small effect (f^2 = .02; Cohen, 1988) was 0.82 in the work sample and 0.41 in the academic sample. In contrast, the power to detect a medium effect (f^2 = .15; Cohen, 1988) was 1.00 in both samples.

Missing data in the supplemental analyses

Many of the studies in the supplemental analysis did not provide sufficient information for calculating the match between the environment and the interest measure. For example, because the most popular congruence indices (e.g., Camp & Chartrand, 1992) are generally calculated on the basis of agreement between an employee's interest profile and the profile of the environment, studies using these indices frequently did not report correlations between performance and a single interest type. Therefore, the agreement between the occupational code and a particular interest measure could not be calculated, and this resulted in a substantial amount of missing data on the matching variables. Moreover, there was insufficient information in these studies to calculate the effects of congruence indices. Consequently, it was necessary to exclude this dummy variable from the analysis. For these reasons, we estimated a separate regression model to identify the effects of matching interests and occupations in our supplemental analyses rather than including these variables in the initial tests. After excluding missing data, these analyses were conducted on the 22 remaining independent studies. However, one of the benefits of the regression model used here is that the parameter estimates were based on 281 correlations. Therefore, the power to detect small (f^2 = .02; Cohen, 1988) or medium (f^2 = .15; Cohen, 1988) effects was .66 and 1.00, respectively, at an alpha level of .05.

Results

Interest–performance correlations in employed samples

We carried out the regression analysis using the PROC SURVEYREG procedure in SAS to account for the nonindependence of correlations nested within studies. The parameter estimates (b_0 through b_{12} from the regression model shown above) from the analysis of the work samples are presented in Table A1. As with any application of regression, the quality of these estimates is dependent on the size of the sample used to estimate the parameters. In the present study, the sample size is analogous to the number of correlations analyzed. Note that this is different from the traditional Hunter–Schmidt techniques where the number of studies (k) and the overall sample size across these studies (N) are used to evaluate the quality of the meta-analytic correlation. In contrast, the power and precision of the regression estimates presented here should be evaluated relative to the 417 correlations that were analyzed in the employed samples.

As shown in Table A1, the results indicate that interests do have a significant relationship with performance in the work setting. The intercept of the regression model was .20 (p < .05), suggesting a moderate baseline relationship between interests and performance. Consistent with our hypothesis, congruence coefficients also had significantly higher correlations than the scale scores alone as indicated by the significant regression weight for congruence indices (b = .16, p < .05). Thus, the least squares predicted correlation between interests and performance was

$$\hat{\rho} = .20 + .16(1) = .36$$

when congruence indices were used. This equation contrasts with the predicted correlation for scale scores alone, which, as shown in the following equation, is equivalent to the intercept of the regression model:

$$\hat{\rho} = .20 + .16(0) = .20.$$

For these equations, note that the other variables in the model (see the full equation shown above) are not shown. When the other variables are coded 0, the regression weights do not affect the predicted correlation (i.e., $\hat{\rho}$) Therefore, to

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provide a more parsimonious illustration, they are not shown in these examples. Thus, .36 and .20 represent the mean predicted values when the other categorical indicators are zero. However, in conditions where the other predictors are coded 1, both significant and nonsignificant regression coefficients would be used to calculate the predicted correlations.

Studies assessing performance by using objective measures (e.g., quantity produced or sales) tended to result in slightly smaller, albeit significant, correlations. The regression weight for this variable was −.06 ($p < .05$). Thus, the least squares predicted correlations between congruence and performance were .30 (.20 − .06 + .16) and .36 for objective and subjective criteria, respectively.

With regard to the criteria, only the regression coefficient for reverse-scored CWB (−.26, $p < .01$) was significant. Thus, the predicted correlation between interests and reverse-scored CWB was .10 (.20 + .16 − .26). However, because the correlations with CWB were reverse coded, the sign of the predicted correlation should be reversed back in the correct direction and doing so provides an estimate of −.10. In contrast, the correlations for task performance (.30 = .20 + .16 − .06), OCB (.37 = .20 +.16 + .01), and persistence (.36 = .20 + .16 + .00) were similar to each other.

Table A1 also shows significant regression coefficients for the SDS and KPR inventories. However, Table 1 in the main text shows that the meta-analytic predicted correlations for each of these inventories were not substantially higher or lower than the others. Table A1 also shows that the coefficients for occupational diversity and longitudinal studies were not significant. Consequently, correlations in samples of employees from diverse occupations or in longitudinal studies were not significantly different from samples in a single occupation or cross-sectional data.

Matching individual interests to the occupation

As described in the main text, dummy variables were created for interest and environment codes with matching, adjacent (e.g., realistic and investigative), and alternate (e.g., realistic and artistic) positions on the perimeter of Holland's hexagon. The results from the corresponding regression analysis are summarized in Table A2. The intercept for this reduced data set was nonsignificant (.06, $p = .55$). However, the coefficients of the dummy variables for both matching ($b = .21$, $p < .05$) and adjacent ($b = .17$, $p < .05$) interests were significant. When the interest measure used to predict performance matched the first-letter code of the occupation, the least squares predicted correlation was .27 (.06 + .21). In contrast, adjacent interests and occupations exhibited mean correlations of .23 (.06 + .17). The regression weight for alternate interests and occupations (e.g., realistic and artistic) was not significant (.06, $p = .19$) and resulted in smaller least squares predicted correlations (.12 = .06 + .06). With this type of effects coding, opposite interests and occupations (e.g., realistic and social) would be represented when the dummy variables for matching, adjacent, and alternate interests are equal to zero. Therefore, the predicted meta-analytic correlation for opposite interests is equal to the intercept (.06).

Table A2. Parameter Estimates for the Supplemental Analyses in the Employed Samples

Predictors	Regression coefficient	*SE*
Intercept	.06	.09
Interest scale		
Self-Directed Search	−.09*	.03
Vocational Preference Inventory	−.05	.04
Kuder Preference Record	−.09*	.04
Strong Interest Inventory	−.02	.06
Criterion		
Task performance	−.08	.05
OCB	.02	.06
Persistence	−.01	.05
CWB	−.28*	.06
Methodological characteristics		
Objective criterion	.01	.03
Multiple position examined	−.10*	.05
Matching scores	.21*	.08
Adjacent scores	.17*	.05
Alternate scores	.06	.04
Longitudinal study	−.01	.04

Note. $R = .47$, $R^2 = .22$, and adjusted $R^2 = .18$. Each of the meta-analytic correlations (i.e., the dependent variables) were corrected for both indirect range restriction and unreliability in the criterion before estimating the regression model. The regression coefficients presented here are the unstandardized coefficients from the model regressing the corrected correlations onto the dummy variables for each of the predictors shown here in this subset of the work samples. OCB = organizational citizenship behavior; CWB = counterproductive work behavior.
*$p < .05$.

Table A3. Parameter Estimates From the Regression Model for the Academic Samples

Predictors	Regression coefficient	*SE*
Intercept	.23*	.10
Interest scale		
Self-Directed Search	.04	.09
Career Assessment Inventory	−.02	.09
Strong Interest Inventory	−.19*	.07
Criterion		
Persistence	.02	.04
Grades	−.02	.05
Methodological characteristics		
Objective criteria	−.03	.04
Multiprogram sample	−.14*	.07
Congruence index	.09	.07
Longitudinal study	.01	.05

Note. $R = .32$, $R^2 = .10$, and adjusted $R^2 = .04$. Each of the meta-analytic correlations (i.e., the dependent variables) were corrected for both indirect range restriction and unreliability in the criterion before estimating the regression model. The regression coefficients presented here are the unstandardized estimates from the model regressing the meta-analytic corrected correlations onto the dummy variables for each of the predictors shown here in the academic samples.
*$p < .05$.

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Interest–performance correlations in academic samples

The estimated regression coefficients for the analyses in the academic samples are presented in Table A3. Consistent with the results in the work domain, the intercept ($b = .23$, $p < .05$) indicated a moderate baseline correlation between interests and academic performance. However, contrary to our hypothesis, the regression coefficient for congruence indices was not significant ($b = .09$, $p = .22$). Thus, it appears that congruence did not have a statistically significant impact on the correlations in academic samples. Despite this nonsignificant result, the magnitudes of the correlations between congruence indices and grades (.27 = .23 + .09 − .02 − .03) or persistence (.31 = .23 + .09 + .02 − .03) were comparable to the interest–performance correlations in work samples. Note that because persistence and grades were typically assessed with objective criteria (e.g., administrative records), the predicted correlations reported here and in the main text assume that objective measures were used.

It is interesting that the coefficients for the SII and for studies with samples from multiple academic majors were both significant and in the negative direction. The estimated regression coefficient for the SII was −.19 ($p < .05$). Similarly, the coefficient for studies of multiple academic majors was −.14 ($p < .05$), and the predicted correlation between congruence and performance was .18 (= .23 + .09 − .14).

Acknowledgments

The authors would like to thank Mark Aber, Janice Juraska, and Thomas Schwandt for their comments on an earlier draft of this article.

An earlier version of this article was presented at the 2011 annual conference for the International Personnel Assessment Council.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Notes

1. The meta-analytic correlations between the six RIASEC types range from .08 (between conventional and artistic interests) to .52 (between conventional and enterprising interests; Tay, Su, & Rounds, 2011), and the magnitudes of these correlations correspond to the distances between the types in Holland's hexagon. For example, realistic interests are more closely associated with investigative interests ($r = .39$) than with social interests ($r = .16$; Tay et al., 2011).
2. Interested readers are referred to Brown and Gore (1994) or Camp and Chartrand (1992) for thorough reviews and empirical evaluations of these indices.

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